# GAS JOURNAL, JULY 5, 1944

VOL. 244 96th YEAR No. 4233


## EDITORIAL NOTES

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The main purport of the report, it strikes us, was the very real need for more education on the use of all fuels, especially in their application to domestic heating; and this education should not be haphazard, but should become part and parcel of the composite school curriculum. His suggestions come at a time when more attention than ever before is being paid to the subject of education generally, when an extension of the period of education of children in the mass seems inevitable. Dr. Smith, believing, rightly we think, that profligacy in the use of coal in the home can be stemmed by greater knowledge of the matter and greater appreciation of its bearing on the national economy at an early stage, urged that the subjects of fuel and domestic economy should be made compulsory at some stage in the child's school life in every school in the land; and he added that general elementary science, in a coming age when science will enter even more than now into everyday life, should be a non-optional subject for, say, the School Certificate. He outlined the type of course he has in mind, which we need not detail here. To our mind it would be a very popular one, and gradually its cumulative effects would have an altogether healthy influence on national economy and communal well-being and comfort. There is nothing far-fetched or over-ambitious about the idea of such a fuel education snowball, which we think could, striking at the roots of the problem, radically improve the use of fuel in its various forms, both domestically and in industry.

There is, of course, a complementary aspect of the problem, and that is how we can advantageously help present consumers to obtain a standard of improved efficiency of fuel utilization as a continuing policy after the war. And in this regard Dr. Smith suggested appropriately and on good grounds that the Institute of Fuel could play a not-inconspicuous part in the general programme. In fact it is preparing for such a part, the while adding its quota to the educational processes that have for their object the creation of a community which is not only fuel-conscious, but intelligently so. With its membership of nearly 2,000 it has recently adopted regulations concerning educational qualifications for membership; there are now seven district sections; the well-informed and numerous discussions for which it is responsible in different parts of the country on all types of fuel are bound to have results of benefit to the public generally. Of particular interest is the intention to concentrate during the coming winter months on two main subjects—insulation and smoke prevention. Every section will deal with insulation in one form or another, and smoke prevention is to be considered in collaboration with the Smoke Abatement Society. Domestic heating is intimately concerned with each of the subjects, and it is to be hoped that the campaign to create the intelligent fuel user will gain momentum. Dr. Smith delineated at least one helpful line along which stimulus is being applied.

### DOG AND TAIL

FOLLOWING our inspection of the Portal prefabricated house, a model of which was on view in London for the purpose of criticism and suggestion, we gave our impressions on the general equipment ("JOURNAL" of May 10). Our comments were based on the assumption that essentially it was designed solely as a stop-gap, as a temporary accommodation for a period not extending beyond about ten years after the war, and we were not concerned very much about the design *per se*, confining our remarks to the equipment for heating, cooking, water heating, laundry, and so on, and mentioning the important place which the Gas Industry played in the general scheme. Since then there has been considerable constructive criticism of the design of the dwelling, and Lord Portal has promised modifications to satisfy some of the suggestions made. Since then, too, a deputation from the Women's Advisory Committee on Solid Fuel, led by Lady Egerton, has waited on Lord Portal, suggesting the use of coal in the open fire, instead of having the house smokeless as originally envisaged, and the Minister has promised to look into the matter. The Committee suggested that in many cases bituminous coal might be the only fuel available—an argument we find difficult to follow considering the likely scale of building of these temporary structures.

In other quarters, however, the term "temporary" has been questioned. What exactly, it has been asked, does this mean? Does it really connote ten years, or is it likely in the event to become something like double this figure? The argument is based on the assumption that the building of some 4,000,000 permanent dwellings, involving a considerable amount of new construction on sites at present occupied by slums, will take about twenty years to execute. And if a proportion of the building and domestic equipment industries is absorbed in "temporary" housing, the period may well be longer. Alterations, it has been pointed out, cannot be made once the hand-made model is put into mass production. The view is gloomy, admittedly, and the gloom is not relieved when one regards some of the dwellings in London designed for "temporary" occupation after the war of 1914–18, but remaining to be classified as permanent. Even so, these post last-war dwellings are, taken all in all, a goodlier sight than many premises we have recently visited in the Metropolis and which depend very largely on gas service—premises often with a seemly appearance exteriorally, thanks maybe to a coat of paint, but with an interior which, if it does not beggar description, at least beggars happiness. Are we, though, intending to attack the present war's aftermath in like fashion?

We return to the Portal House, and at the same time to what has interested us most concerning the discussions about it, which have included contentions frivolous as well as helpful and serious. From the Gas Industry's angle, what we consider as having import is whether there can be any truth in the suggestion that the tail may wag the dog. The Portal priority house, viewed in relation to "permanent" buildings—*i.e.*, modern buildings—has been described, and no doubt rightly, as very much sub-standard in its accommodation. The while it is without question super-standard in its equipment and fittings. And it has been argued that because it is equipped and serviced to a standard well above normal, it will be very difficult to find any justification for pulling it down until the general supply of up-to-date houses throughout the country is sufficient to satisfy demand. And what will be the obvious building incentive? Slum dwellings, presumably, must be cleared away; country cottages without water and hence without bathrooms must be rebuilt or reconditioned; so we could go on. Destruction through enemy action of existing property—much of the property in good condition and well equipped—continues, as everyone knows. But we are not going to attempt even the vaguest

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prophecy concerning the speed of achieving a building and reconstruction programme the dimensions of which, already immense, cannot yet be determined. Of course the problem must be tackled resolutely, and it does seem to us that the labours of the Ministry of Works during the past stressful years of war will be found of untold practical value in the solution of the problem with a minimum of delay and confusion. It seems to us, too, that there is no fundamental reason why the tail of equipment should wag the dog of dwelling design.

Equipment such as that in the Portal house is bound to create a huge demand, but the fact to bear in mind is that the equipment is applicable equally to permanent and temporary dwellings. Because the equipment is good, because it affords the housewife convenience, comfort, and cleanliness, because it automatically builds-up a higher standard, that in itself should not be used as an excuse for allowing a temporary dwelling to lapse into semi-permanency. The equipment is translatable and transportable, and certainly ought in no way to be held responsible for delay in the provision of permanent dwellings. "Beware of the dog," maybe; but surely we are not called upon to dither about its tail.

## "Infra-Red"

War munitions must be produced at war speed, and because so many are protected by paint, painting has to be geared to war speed. Stoving in the orthodox convection oven has frequently proved a bottleneck, and radiant heat methods with shorter stoving times have been developed. We have described in the "JOURNAL" types of gas-heated radiant equipment which have proved and are proving eminently suitable for the process. The results have indeed been excellent. Time has been saved, and in some cases the finishes have been improved. Actually heating by radiation is a simple enough phenomenon, but, as is pointed out in a useful booklet on the subject of drying paints published by Imperial Chemical Industries, a cloak of mystery has been thrown around it by the use of the term "infra-red." To refer to radiant heating as "infra-red" is misleading, and we agree with I.C.I. that industrial users would be well advised to avoid using the term in connexion with the drying of paints, and use "radiant heat" instead. The booklet we have mentioned explains on broad lines what is involved in the application of heat rays to paint films.

## Solid Fuel Allowances

The Minister of Fuel and Power has decided to extend the present coal restriction period in England and Wales. From May to October inclusive the maximum quantity of house coal, kitchen coal, and Coalite which may be supplied to any controlled premises in the South of England is 30 cwt. Stocks of these fuels may not exceed 30 cwt., including any deliveries which may be made. In the North of England and in Wales maximum deliveries must not exceed 2 tons, and the stock limit is 2 tons. During the same period the maximum deliveries of coke, small anthracite, small Welsh dry steam coal, and manufactured fuels may not exceed 3 tons; the stock limit is 3 tons. In Scotland, because industrial disputes have rendered the supply position very difficult, controlled premises may not be supplied with more than 25 cwt. of house and kitchen coal, including Coalite, for the four months July–October, and the stock of these fuels must not be raised above 30 cwt. Coke, small anthracite, and manufactured fuels (other than Coalite) may be acquired up to 2 tons, and stocks of these fuels must not exceed 2 tons. Consumers are urged to place orders for as much fuel as they can store within the above limits.

# Ministry of Fuel and Power

### Committee of Enquiry into the Gas Industry

The Committee of Enquiry into the Gas Industry recently appointed by the Minister of Fuel and Power has now met and invited evidence from a number of organizations connected with the Industry and from certain other bodies who they think are likely to have a special interest in the subject of their enquiry, as defined by their terms of reference—*i.e.*, "To review the structure and organization of the Gas Industry, to advise what changes have now become necessary in order to develop and cheapen gas supplies to all types of consumers, and to make recommendations."

Any other organizations or persons wishing to submit evidence, which must be in writing, will facilitate the work of the Committee by communicating at an early stage with the Secretary at the Gas and Electricity Division, Ministry of Fuel and Power, New Oxford House, Bloomsbury Way, London, W.C. 1, giving an outline of the evidence they wish to submit.

# Personal

### Liverpool Appointments

At a meeting on June 26 the Directors of the Liverpool Gas Company decided with regret to accept the resignation of the Chief Engineer, Mr. W. FLETCHER, on the grounds of ill-health. Mr. Fletcher joined the Liverpool Gas Company in 1907, and became Chief Engineer when Mr. Ernest Astbury retired on Jan. 1, 1943, simultaneously with his appointment as President of the Manchester District Association of Gas Engineers.

Mr. W. S. HUBBARD, who has been appointed Gas Engineer to the Company, is an Associate Member of the Institution of Mechanical Engineers, and an Associate of the Manchester College of Technology. He holds the Silver Medal of the S.B.G.I., the Bronze Medal of The Institution of Gas Engineers, and the Clayton Medal of the Yorkshire Junior Gas Association. Mr. Hubbard was educated at Newton Heath Technical School and the Manchester College of Technology, and after serving Articles with Messrs. R. & J. Dempster, Ltd., he entered their drawing office and later became Chief Draughtsman to the Stockport Gas Department. Leaving Stockport, Mr. Hubbard entered the services of the Leeds Corporation Gas Department and became, successively, Assistant Works Manager at the New Wortley and Meadow Lane Works, and Manager of the Meadow Lane Works in 1938. Appointed Works Manager of the Garston Works of the Liverpool Gas Company in 1941, Mr. Hubbard proceeded to the Head Office as Construction and Maintenance Engineer in 1943.

Mr. H. MOYS, B.Sc., Assoc.M.Inst.C.E., has been appointed Deputy Gas Engineer.

* * *

On June 22 Mr. F. H. GOODWIN retired from the position of Engineer and Manager of the Salford Gas Department, and the officials suitably celebrated the occasion by presenting him with a gold wristlet watch. The presentation was made by the Chairman of the Light, Heat, and Power Committee (Councillor C. J. Townsend, J.P.) on June 21. In making the presentation the Chairman paid high praise to Mr. Goodwin's valuable and faithful service with the Undertaking, extending over a period of 35 years. The Chairman was supported by the Deputy Chairman (Councillor J. Brentnall, J.P.) and Mr. D. V. Lewis, the present Engineer and Manager.

* * *

Mr. JAMES H. JAMIESON, Manager of the Doune Gas-Works, has been appointed Engineer and Manager of the Kirkcudbright Gas-Works. He succeeds Mr. ARTHUR G. ARNOTT.

* * *

Mr. R. H. GOLLINGS, Eastern Counties representative of John Wright & Co., Ltd. (Radiation Ltd.), retired from active business, for health reasons, on July 1. He has served the Company for 38 years and has a large circle of friends in the Industry.

* * *

Dr. E. H. T. HOBLYN, Ph.D., A.R.C.S., A.R.I.C., A.M.I.Chem.E., has been appointed Secretary of the British Chemical Plant Manufacturers' Association.

# Obituary

The death took place on June 29 of Mr. HEDLEY HOY, at the age of 64. Deceased retired from the position of Engineer and Manager to the Workington Gas Department in 1941. He began his career in the Gas Industry in 1899, and became Assistant Manager to the Lancaster Gas Department in 1904. In 1912 he was appointed Gas and Water Manager at Tyldesley, and four years later took up the post of Engineer and Manager to the Cannock and District Gas Company, whence, in 1919, he went to Workington.

* * *

As recorded in our issue of June 7, Mr. JOHN PHILIP BLACKMORE, Public Lighting Superintendent of the Bombay Gas Company, Ltd., for the past 23 years, died on May 30, at the age of 48 years, after a short illness. A member of the Association of Public Lighting Engineers, he was a Magistrate of Bombay and also an Honorary Presidency Magistrate of Bombay, and an Adjutant of the Bombay Civic Guards. He was also Hon. Secretary of the Ex-Services Association, India, as well as being on other Committees engaged in charitable work irrespective of nationality, castes, or creeds. He was responsible for carrying out some excellent gas street lighting.

* * *

The death has occurred of Mr. STANLEY HODGKIN, Senior Director of the Pulsometer Engineering Company, Ltd., in his 85th year.

*(Correspondence and further news will be found on p. 27)*

# A Comparison of Aerated and Non-Aerated Burners for Gas Appliances of the Future*

By ARTHUR FORSHAW, M.Sc.

Chief Chemist, R. & A. Main, Limited

THE title of the Paper is a general one and therefore capable of covering both domestic and industrial appliances, all varieties of which are heated in one of two ways—namely, with or without flame contact. The difference between domestic and industrial gas appliances is mostly one of size, and as this is not fundamental, findings from the one are generally applicable to the other. The Paper is therefore confined to the consideration of the former.

## Domestic Gas Appliances.

Such appliances may be divided roughly into three classes—namely, for cooking, for space heating, and for water heating—and the application to them of all-gas flames (to use a shortened term) is considered briefly here.

Bunsen burners have predominated for some fifty years, and a reversion to all-gas flames will require solid justification. This may be sought for under several headings, as follows:

(i) Performance: thermal efficiency; effectiveness; convenience.
(ii) Cost: first cost, maintenance costs—*i.e.*, renewals, replacements, repairs, attention.
(iii) Sales appeal.

On *a priori* grounds one might expect operations with free-burning flames, such as cooking in an oven, to continue satisfactorily whether the heat be developed from all-gas or from Bunsen flames, and any operations involving flame contact for its successful outcome to depend on whether such contact can be made without formation of deposits of carbon or of other products of incomplete combustion.

Originally gas was burned directly from holes in pipes and later in flames caused by two jets impinging and so producing a flat flame, or proceeding from slots shaped to give a flat flame. The point to remember is that the primary object of all these methods was the production of light. As a consequence gas was made as rich as possible, but above all it was supplied at a low pressure in order to avoid the turbulence which would result in admixture with air, and so in reduced luminosity.

It will be appreciated that under such conditions flames were on the point of smoking, and contact, even of the tip of such a flame with a solid body, was likely to cause a deposit of soot and other evidence of incomplete combustion, particularly if the body was cold. To avoid this it was necessary to leave a considerable distance between the vessel and the flame, if the latter was vertical, because slight fluctuations of pressure, of which the effect on consumption would be negligible to-day at the much higher pressure of supply, had a considerable effect on the height of flame at the 7 to 10 tenths then favoured in practice, as had, similarly, variations in candle-power. Such being the facts, one can realize the immediate improvement made possible by Bunsen's invention (*circa* 1855) of the aerated type of burner, and it even came to be believed that a Bunsen flame develops more heat than a luminous one, whereas the real position was, of course, that more heat could be utilized.

## Non-Aerated Burners.

How is it then that there is a movement to-day in the direction of substituting non-aerated for aerated flames, a movement which in the light of the above remarks might appear to be a disadvantageous step, at any rate for operations involving flame contact? The explanation is a three-fold one—namely, the non-aerated burners of to-day must not be confused with the luminous ones of yesterday, the quality of gas is now entirely different, and the pressure of supply is very much higher. The net result of these three differences is that the all-gas jets of to-day do not in fact give luminous flames; even with, for these days, comparatively rich gas, the flame for a given input of gas is smaller and very much less luminous than if an old-fashioned luminous flame jet is used. This has been pointed out and a photographic comparison shown in a recent paper.†

From the chemist's point of view, this result can only be accounted for by assuming that the flames from these modern jets are not entirely non-aerated. The design must be such that some air is drawn into the gas as it issues from the orifice. The flames from these modern all-gas burners may, up to a point, come in contact with vessels without deposition of carbon and without developing an objectionable $CO/CO_2$ ratio, and it is this fact which makes their use for cooker hotplate work possible. Just as there is no reason to avoid some measure of contact with all-gas flames, so there can be no reason why they should not be used for all operations which do not involve flame contact. If there are objections to their use these must be from other points of view which will now be briefly discussed.

* **Paper to The Institution of Gas Engineers.**

† Chandler, D., "Gas Flames: The Case for Aeration Entirely at the Point of Combustion," GAS JOURNAL, 1943, **242**, 451.

*Vulnerability.*

First there is "vulnerability," which has several aspects. The gas to a Bunsen burner is supplied by an injector nipple which is particularly well shielded from damage caused by handling, by the effect of heat, and by stoppage from spillage, or the like; the burner and nipple, moreover, are of metal. In an all-gas burner, on the contrary, the actual orifice is usually in ceramic material and is exposed to heat, ill usage and the effects of spillage. At full-on rates heat causes reduction in the original gas rate; thus in burner B1 (fig. 2), used for boiling water, the consumption goes down by about 8% within 8 min.

The effects of ill usage "depend," of course, and it may be that so far as domestic appliances are concerned the more vulnerable nature of the material will not be put to the proof.

Stoppage by spillage is perhaps the most serious aspect of vulnerability, and it is absolutely necessary to provide some form of protection for all-gas burners exposed to this possibility. This is particularly the case on the hotplate for several reasons—*e.g.*, the fact that individual stopped-up all-gas burners reduce the gas rate *pro rata*; the difficulty of making burners consisting of all-gas jets removable for examination and cleaning; the greater difficulty of freeing obstructed all-gas jets without damaging them; the possibility of partial stoppage deflecting flames so as to cause incomplete combustion.

In an oven the effects of heat on gas rate are unimportant. The removal difficulty remains, while the possibility of damage by handling during use is probably less than on the hotplate. There is also the fact that full-on all-gas flames are more directional than Bunsen flames, and so cannot always be substituted for the latter without further adjustment or rearrangement. Stoppage by spurting of fat and the like is still possible, and the only certain prevention is adequate shielding, which presents various difficulties, or the removal of the burners to a separate compartment, which may result in a reduced thermal efficiency of operation.

This factor of vulnerability is one for which definite figures cannot be put forward either for or against the use of all-gas burners. No test known to the makers' technical department can be accepted as a substitute for the use of a considerable number of the actual "production" appliances in the hands of ordinary consumers, over a period of at least two years. So far as the Author is aware, no modern all-gas domestic cooking appliance has had this apprenticeship, which is necessary before a firm assessment of its value can be made, however favourable the results of the other available tests, or opinions, may be, such as those for thermal efficiency, cooking and the like.

*Cost.*

Another factor is that of cost. In the absence of definite models this can only be discussed in a general way, but a hotplate boiling burner can be used to illustrate the position. A Bunsen ring-burner rated at about 11,000 to 12,000 B.Th.U. per hour would consist of a casting drilled with about 25 holes and provided with a gas-injector and usually with a gas adjuster and an air controller. An all-gas burner of similar output would require 12 jets and a casting with 12 drilled and tapped holes to accommodate them, as well as the necessary protection against spillage and a means of making a breakable joint to the gas supply. From this statement it would seem clear that the all-gas burner is bound to be more expensive in production, for, assuming that the brasswork roughly costs the same for both burners—*i.e.*, adjustable injector and air controller as against union or other connexions, and that the castings also more or less balance—the all-gas burner still requires not only the 12 jets, which in turn necessitate more expensive fitting to ensure the correct direction of each individual flame, but also the provision of spillage protection. To these items of expense must be added certain on-costs caused by the fact that the jets must be bought from outside. The same reasoning applies to all the burners on or in a cooker, and with three or four boiling burners and a grill, plus the necessary oven jets, the increased costs of the all-gas model would appear to be appreciable.

So far, cooker burners have been taken by way of illustration, and this to some extent anticipates what may be said of these appliances in their proper place, where, however, it will be unnecessary to repeat the points.

In spite of these conclusions as to the cost of all-gas burners in cookers, similar considerations on gas fires lead rather to the opposite result, namely, that an all-gas burner is likely to prove somewhat less costly to produce than the present Bunsen burners with their eddy-filters and gas, pressure and other adjusters, &c.

The classes of appliances may now be considered, together with the criteria by which the effect of using all-gas burners with them may be judged.

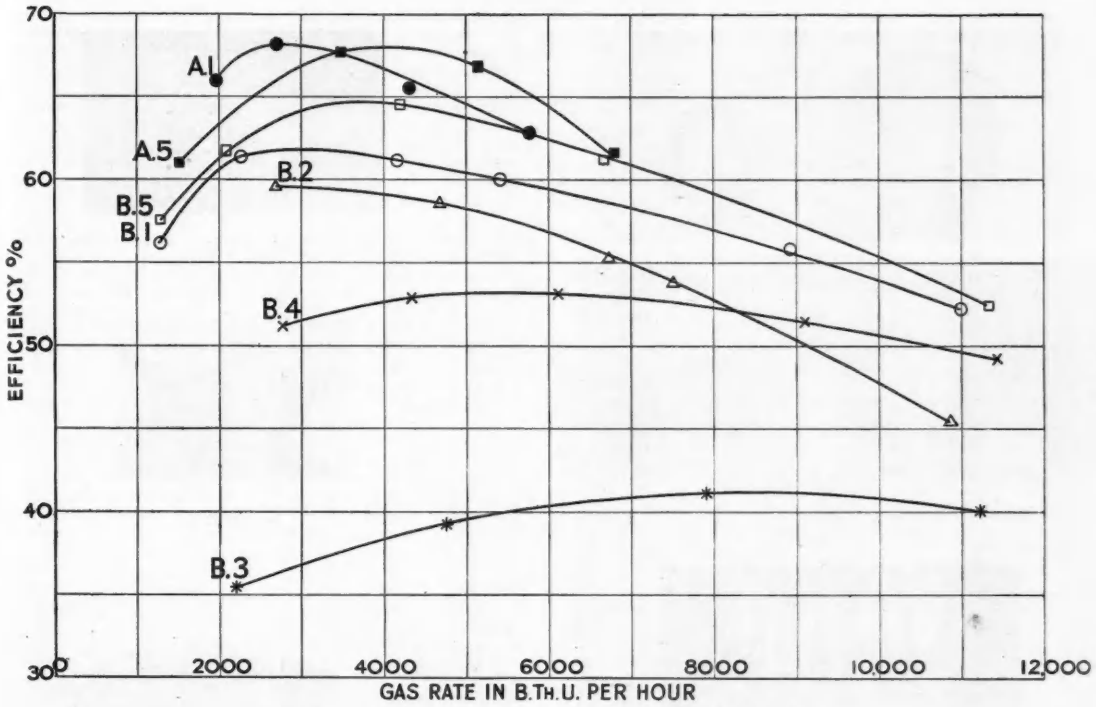



FIG. 1.—*Curves Showing Thermal Efficiency of Hotplate Burners.*

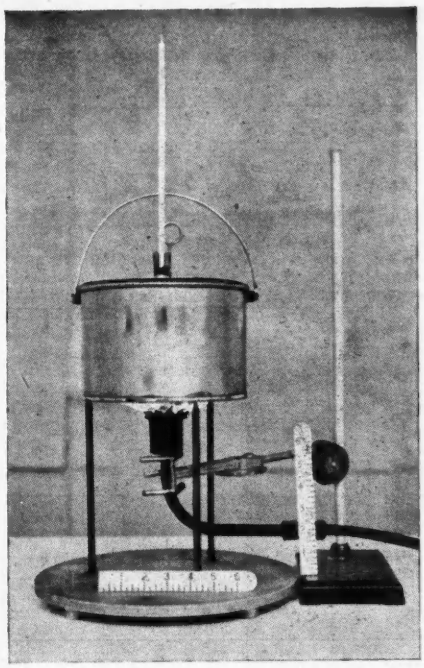


FIG. 2.—*Standard Efficiency Test with Burner* B 1.

COOKERS.

*Thermal Efficiency.*—Some Bunsen and all-gas hotplate burners have been put through a standard efficiency test in which 5 lb. of water are raised through 80°C. in a 7¼ in. covered vessel. It was intended to use two sizes of boiling burner, each with two forms of Bunsen head; these were drilled rings and ace-type flat-flame, and three forms of all-gas burner—namely, with upright pinhole flames, upright flat-flame jets, and horizontal flat-flame jets. Each of these five small and five medium burners was to have been tested further at three different calorific values of gas. Owing to shortness of time, the preoccupation of staff with work of more immediate national importance and the variation of gases from their pre-war values, this programme has failed to be completed. It is possible, however, to give some results which are not without interest.

In fig. 1 are shown curves characteristic of the above-mentioned varieties of burners. In order to remove a variable factor, no hotplate bars were used, the pot being supported on the points of three upright rods as near its edge as possible (see fig. 2).* Several check tests with appropriate bars showed efficiencies lower by some 4 to 5 units at full-on rates.

The burners used were as follows (fig. 3):

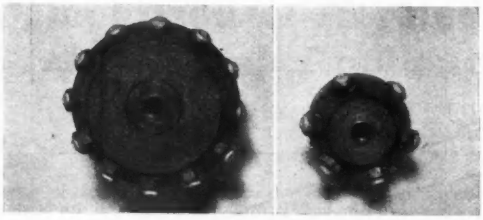
At 5,000–6,000 B.Th.U. per hour, full on:
- A 1.—All-gas jets (6), inclined at 25° to the horizontal.
- A 5.—Bunsen ace-type, nine-flame.

At 11,000–12,000 B.Th.U. per hour, full on:
- B 1.—All-gas jets (12) (as A 1).
- B 2.—All-gas jets, vertical.
- B 3.—All-gas pinhole (jets, vertical).
- B 4.—Bunsen ring burner.
- B. 5.—Bunsen ace-type, four-flame.

The curves are self-explanatory, and it suffices here to record that under these conditions horizontal flames, whether all-gas or Bunsen, show the highest efficiencies until the upper limit of rate is approached, where the vertical flames having the flatter curve approach more nearly to the horizontal flames. The vertical all-gas burner is a partial exception, for its efficiency, whilst higher at low rates than the other upright flames, falls more rapidly at higher rates. In comparing results it should be noted that burners A 1 and B 1 were provided with spillage protectors, whereas the other all-gas burners B 2 and B 3 would require an allowance for the effect of such protection on the efficiency.

*Combustion Efficiency.*—In fig. 4 the effect on combustion of varying the distance of the burner from the pot at a constant rate of about 11,000 B.Th.U. per hour at a calorific value of 450 B.Th.U. can be studied. It will be understood that if vertical flames be moved in quarter inches, horizontal flames show similar efficiency variations with very much smaller movements away from the pot. One remarkable feature of these results cannot be shown effectively on a curve; it is that vertical flame burners when brought nearer to the pot can suffer from the most convincing visual signs of smothering and incomplete combustion without any real production of carbon monoxide. The mere figures and remarks printed with the curves can convey no idea of the actual appearance, which to any gas-man would be most upsetting. It will be noted that at all settings of horizontal flames, Bunsen or all-gas, no significant $CO/CO_2$ ratio could be found at this calorific value. A few tests made at a higher calorific value (*circa* 490) with burner B 1 showed, as might have been expected, a tendency

* In illustrations of burners in action the gas has been slightly enriched to define the flames.



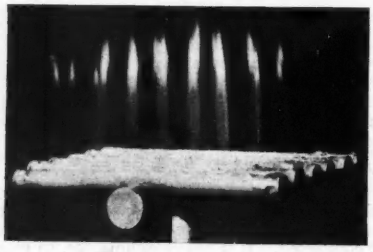
Burners B 1 and A 1, with their Spillage Protectors.

Burner B 2.

Burner A 5.

Burner B 1.

Burner B 5.



Burner B 3.

Burner B 4.

FIG. 3.—*Types of Burners Used in Tests.*

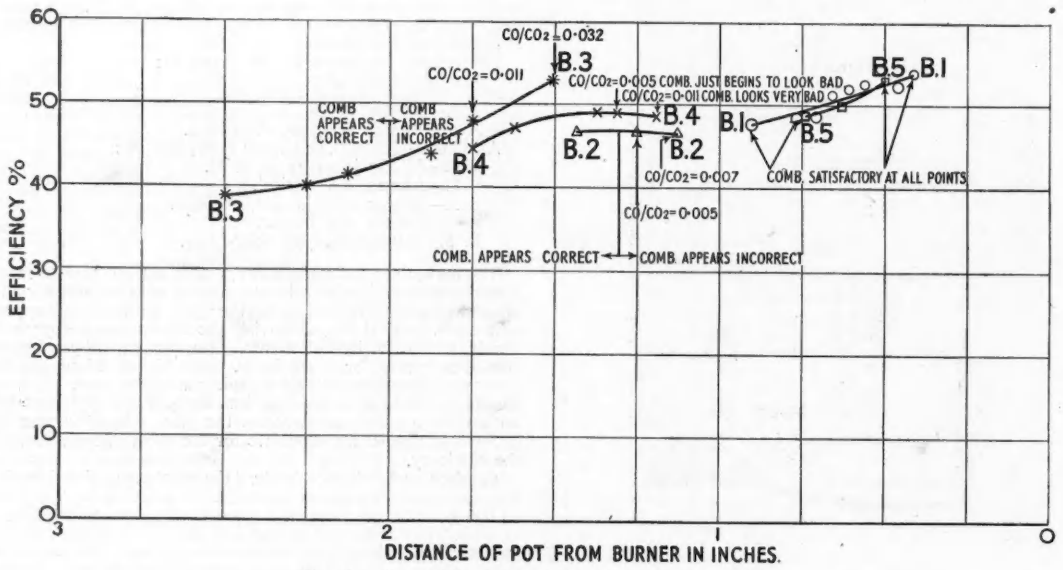



FIG. 4.—*Curves Showing Variations in Combustion Efficiency.*

towards a higher $CO/CO_2$ ratio when the burner was brought nearer to the pot than its standard $\frac{9}{16}$ in. The ratio was, however, less than 0.01 until a distance of 0.4125 in., the shortest possible, was reached. At this point, which corresponds to the extreme right-hand point shown on fig. 4, burner B 1, it was 0.018. The efficiencies with the higher calorific value were slightly lower, three tests, including that at $\frac{9}{16}$ in. (0.5620 in.), averaging 25% against the 53.2% for the last four on the curve in fig. 4.

Here again, in both classes of burner, one might expect the provision of bars to have an adverse effect on the $CO/CO_2$ ratio.

*Effectiveness.*—Under this head are included the time of boiling, liability—or the opposite—to burn thick mixtures, &c. It is not possible to give numerical values to these in the way one can to a thermal efficiency, and anything like a complete assessment under this head cannot be attempted at present. Opportunity has been found, however, to have burner B 1 (nearly horizontal all-gas flame) tried out against a Bunsen ring (not exactly B 4) by a householder who eventually became an advocate of burner B 1. She reported as typical that re-constituted milk, which apparently burns very easily, was practically immune when heated over B 1 and that the pan remained clean on the

internal surface, whereas with the Bunsen ring used much more attention was required to ensure freedom from burning, and the pan was usually found to be covered with a film after the milk had been poured out. On the other hand, a test with porridge cooked on the actual burners B 1 and B 4 illustrated was not so conclusive. Medium oatmeal was brought to the boil over full-on gas, which was then reduced; simmering was continued without stirring for ¾ hour. No actual burning occurred in either case, but rather more material stuck to the pan heated by burner B 1 than was the case with B 4. A chef, using the same two burners, reported that white sauce (flour, "butter" and milk) could be prepared with much less attention and fear of "catching" with burner B 1 than with B 4.

Scrutiny of these tests shows they are inconclusive, and that differences of cooking effect may be due not so much to the difference between all-gas and Bunsen flames as to that between nearly horizontal flames in the case of B 1 and substantially vertical ones in the case of the ring burners.

*Convenience.*—This includes such items as ease of cleaning, ability to turn down to small flames without trouble, stability of reduced flames, resistance to lighting-back, and the like. In all these (except perhaps cleaning, on which there is no information), the burner B 1 scored over B 4, but the Bunsen burner is much easier to remove for the purpose as no gas-joint has to be broken and remade.

Non-lighting-back and flame stability at low rates are indeed directions in which all-gas burners are manifestly superior to Bunsen burners. Even a non-lighting-back Bunsen (which can be made albeit at a high cost) cannot have so stable a flame when turned down low as any of the all-gas burners mentioned. Finally, all-gas burners are noiseless, and cannot get out of adjustment, although it is but fair to add that the latest Bunsen burners have a governed fixed injector which is not subject to maladjustment of gas.

*Sales Appeal.*—This consideration, apart from anything mentioned or inherent, cannot be profitably discussed here.

*Grill.*—Late pre-war grills with Bunsen burners gave radiometer efficiencies of 25 to 27%; tests made with all-gas burners have so far shown no more than about 20%. There seems reason to hope that further work would increase this to about the higher figure. The practical toasting results were indistinguishable one from the other.

*Oven.*—Baking tests have been made with Bunsen and all-gas burners consecutively in two ovens, one with horizontal and one with vertical flames. The Author has also been fortunate enough to find a Main cooker of *circa* 1880, with its original luminous flame jets, in which scones have been baked.

Briefly, an earlier suggestion can be confirmed that owing to all-gas flames being stiffer and therefore more definitely directional one cannot simply substitute them for Bunsen flames and hope for successful results. In an oven designed for vertical Bunsen flames, substitution by all-gas flames showed a marked increase in sole heat with scones —*i.e.*, the high-temperature test of B.S. 1115, 1943—whereas with Queen cakes, which require a lower temperature, there was little difference except that the lower tray showed slightly more scorching of the outer edges of the cakes and the upper tray was slightly superior in appearance compared with the results from the Bunsen flames.

In the cooker designed for horizontal Bunsen flames scones were badly burned on the soles, principally because at this temperature the flames were still quite stiff, even after the thermostat had taken control. With Queen cakes, where the temperature required is lower and the flames much slacker, there was little to choose between the results from all-gas or Bunsen flames.

These results also seem to lend some support to the view that all-gas flames give slightly more direct radiant heat, thus helping to account for the extra sole heat in scones and the slight scorching on the lower tray of Queen cakes in the vertical flame oven. This is also borne out by the fact that the oven always used slightly more gas when baking with all-gas burners, presumably because heat was either utilized more completely nearer the lower parts of the oven or escaped more easily through the sides, and so a smaller proportion than usual reached the thermostat rod. In this connexion it must be remembered that in neither oven were the burners shielded from deposits, and any resulting radiation would not be interrupted in its passage to the tray.

The old cooker included an oven 19 in. wide by 20½ in. deep by 26 in. high inside. It had 34 burners, each comprising a short upright with a projecting head under which were drilled three holes giving horizontal white flames like three ribs of a fan. They were disposed round the four sides of the oven. A first baking of 40 scones failed to brown anywhere. After introducing a browning shelf, however, good results were obtained, with the significant exception that the bottoms of the lower tier were slightly more browned than their tops. The cooking time was long, however, and the gas used was high. The inside of this interesting old cooker is shown in fig. 5.

The slightly greater sole-heat on the lower tier of this oven—and of the vertical-flame all-gas oven with scones (fig. 6)—recalls that for such an oven sixty years ago it was claimed that it excelled for meat roasting, as against Bunsen flame ovens, because the luminous flames gave a higher percentage of radiant heat. The interesting factor, if the claim was justified as these various results would allow to have been possible, is whether such a result can be expected from all-gas heated ovens to-day; for two reasons it seems doubtful—namely, that all gases are poorer and less luminous and that the all-gas burners now in use do not give really luminous flames. Little increase in the proportion of radiant energy is therefore likely, whilst protecting devices for burners (which none of these ovens had) and means of support for food in the oven would make its utilization problematical.

*Efficiency.*—No maintenance tests were attempted, as little difference was anticipated. As already remarked, slightly more gas was used in the all-gas ovens, and further close experimental work might prove or disprove the suggested explanation.

*Convenience.*—The considerations under hotplate burners are mostly applicable again here. In addition, the all-gas burners permit the thermostat to use the smallest possible by-pass flame without any fear of lighting-back and little of being blown. All-gas burners must be so placed as to light from each other without fail.

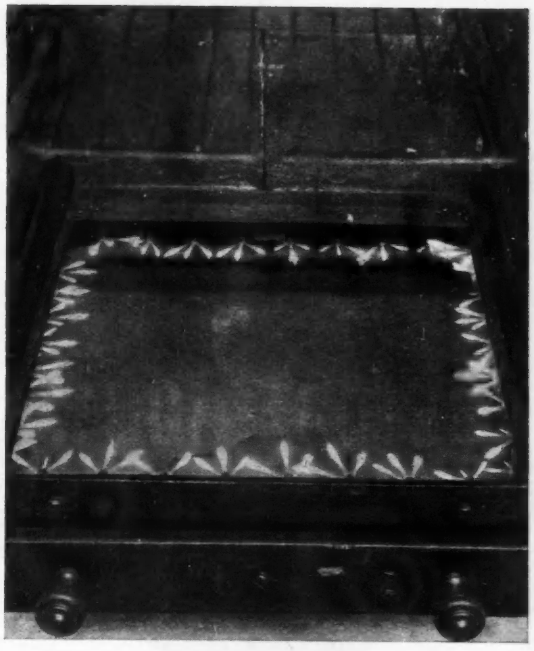


FIG. 5.—*Burners Alight in an Oven of* circa 1880. *Note bottom tray and lining tiles.*

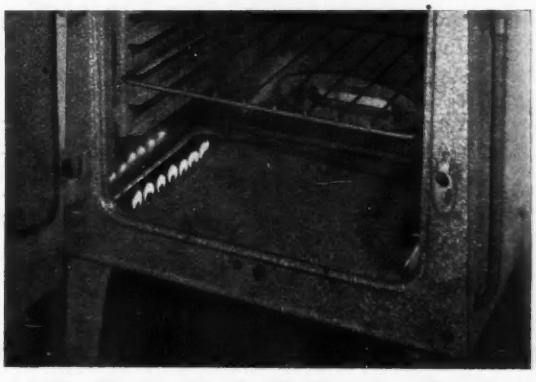


FIG. 6.—*Oven with Vertical All-Gas Flames.*

## GAS FIRES.

Tests have been made with Bunsen and all-gas fires, using various qualities of gas.

*Radiant Efficiency.*—So far as they go, they reveal that with the two fires used, two each of which were tested, the Bunsen type gives a considerable advantage over the all-gas. It may be, of course, that further research work will result in raising the radiant efficiency of the latter, but until that is the case the results epitomized on the curve in fig. 7 (which have been confirmed at full-on rates by an independent laboratory) show how particularly important it is that the radiation from the all-gas fire should be supplemented by a considerable propor-

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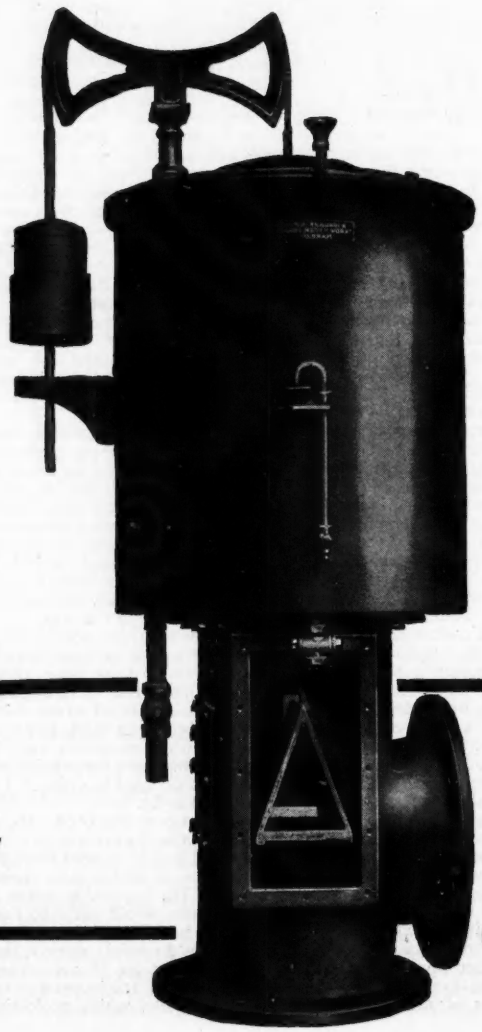

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tion of convection. The curve shows the comparative efficiency of the all-gas fire against the Bunsen fire, the efficiency of which is assumed to be 100% at all-gas rates. It reveals, however, that when turned down from, say, 30 to 22 cu.ft., the all-gas fire does not lose its efficiency to quite the same extent as does the Bunsen fire.

Automatic reduction of gas rate occurs during the heating-up of an all-gas fire, in this case by 15% in 1 hour.

*Appearance.*—Many observers have preferred the all-gas fire, which has perhaps a more uniform glow over the whole surface, particularly when turned down.

*Combustion Efficiency.*—One other factor in favour of the all-gas fire is that in none of the tests made could any significant quantity of carbon monoxide be found.

*Convenience.*—Under this term is found the chief justification of the all-gas radiant fire. It is its silence in use.

*Cost.*—Another and possibly equally important advantage is freedom from maintenance costs.

A further claim for all-gas fires is that their radiants are less vulnerable. This does not seem to be a fundamental difference. If stouter radiants are required and can be justified for Bunsen fires, they will doubtless be forthcoming.

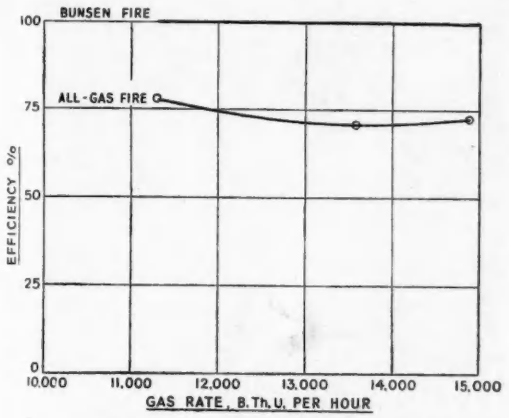


FIG. 7.—*Efficiency of All-Gas Fire Compared with that of Bunsen-Flame Fire.*

### WATER HEATERS.

It is with these appliances that the Bunsen burner has either never conquered the ground, or, alternatively, has since lost it to the non-aerated flame. This is particularly due to the facts that most water heaters are subject to severe fluctuations in consumption and must not risk lighting-back.

All types of non-aerated burners have been used with various heaters, but they are now in practice confined to the all-gas industrial jet or the all-gas pinhole flame. So far as the Author is aware, in none of the appliances so heated dare use be made of actual flame contact. This has resulted in the production of comparatively tall appliances, such as the geyser and the continental type of instantaneous heaters. The reason is clear, namely, that where a large volume of gas has to be burned in a comparatively restricted space, unless primary air is previously added to it the flames tend to coalesce and lengthen. Sufficient height must be provided for this purpose or else incomplete combustion will ensue.

With regard to flat and pinhole flames, probably the latter are capable of burning more gas in a given cross-section provided the height is sufficient, whilst the former give a shorter flame provided there is sufficient width to accommodate the flames. The pinhole flames are, however, often used because of the lower cost of the necessary parts of the burner.

It may be said that all-gas flames of one sort or another are used in most water heaters on the grounds, not of efficiency or effectiveness, but of convenience, and that were it practicable to use a highly-aerated Bunsen flame it might be possible to reduce the overall size of some types of heater.

Space permits only the further remark that the question implied in the title of the Paper is not yet possible of conclusive answer in one direction or the other. The final test (if in such a matter finality is possible) is service by production models for at least two years in the hands of the ordinary user. This test the Bunsen-flame domestic appliances have long since passed; it now remains for the all-gas appliances to show that they possess equal or higher merit when all criteria, such as already tabulated, are taken into consideration.

Since writing this Paper, the Author has had an opportunity of reading a recently-published Paper entitled "Further Observations on the Combustion Characteristics of Town Gas."* The section on the combustion of gases in non-aerated burners is of particular interest, and confirms that modern all-gas burners render the flame non-luminous through the entrainment of air. The summary of the behaviour of flames on non-aerated burners, given on p. 3 of the Paper, should be noted.

The Authors point out (p. 27) that certain qualities of town gas give flames which deposit soot very readily, particularly when turned down, —*e.g.*, those gases containing appreciable percentages of benzene or large amounts of ethylene—although in the examples given the flames are stated to have been non-luminous. They also draw the conclusion that such a gas may be unsuitable for use with all-gas burners in some domestic appliances—*e.g.*, gas fires.

The relative advantages and disadvantages of the non-aerated burner, as compared with the Bunsen type, are set out on p. 36 of the Paper.

* Fuidge, G. H., Dewhurst, J. R., and Pleasance, B., *Inst. Gas Eng. Comm.*, No. 266, 1943.

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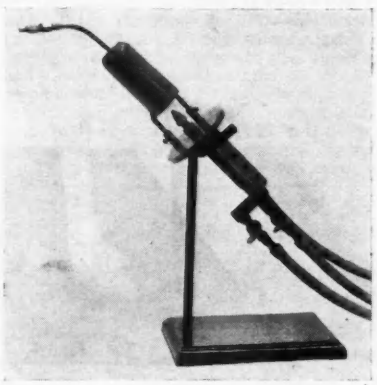
## Welding of Plastics

An entirely new industrial application of gas, and one that promises considerable development after the war, is its use in the welding of plastics. The process originated in Germany, but with the growth of the plastics industry in this country its adoption will probably play an important role in the production of apparatus and equipment for industrial and domestic use.

At present the variety of plastics that can be successfully welded is somewhat limited to materials like polyvinyl chloride and polythene, but those who are developing the process believe that the range will be greatly increased immediately after the war. So far as the general principle is concerned—the application of heat and the use of a filler rod—the welding of plastics resembles the well-established oxy-acetylene and oxy-coal gas processes commonly applied to metals, but with the important difference that instead of using a naked flame, heat is conveyed to the welding point by heated nitrogen or other gases.

The first demonstration of the process in this country was given to a recent crowded joint meeting of the Institute of Welding and the Institute of the Plastics Industry by Dr. J. H. Paterson, Managing Director of the Arc Manufacturing Co., Ltd., following a Paper which he had presented to the meeting on "The Welding of Plastics." We have since had an opportunity of seeing actual work being carried out in the Company's laboratories.



*Gas Torch for the Welding of Plastics.*

The welding torch, as shown in the illustration, is a very simple arrangement containing a gas burner which raises the welding gas—*e.g.*, nitrogen—to the required temperature, and delivers it in a fine jet at the welding point. The special advantage of gas heating in this welding process is the light weight of the torch and the easy control of temperature that can be obtained.

It is important to keep the temperature of the hot gas jet just above the softening point of the plastics, but below the charring and decomposition temperature. The softening point of polyvinyl chloride is 130–170°C., and that of polythene is about 100°C. The decomposition temperatures are not a great deal higher, so that the temperature of the nitrogen jet has to be controlled within fairly narrow limits. An excess of heat produces gas bubbles and decomposition of the material, and too little heat causes insufficient bonding. When the correct temperature is employed the weld attains approximately 80% of the strength of the parent material.

So confident of the future growth of the process are the Directors of the Company that they are sponsoring the first British school for the training of plastic welders, which is to be opened in London in September.

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# The Internal Installation in the Post-War Home*

By R. N. Le FEVRE, A.M.I.Mech.E.,

Officer in Charge of Training, Gas Light and Coke Company

(*Concluded from vol. 243, p. 832*)

In one place it was the normal practice to run "compo" gas pipe, water pipe, and uncased electricity cables in the same chase up the wall, the whole being covered with a thin rendering of plaster. It is impossible to obtain either neatness or ridigity with "compo." Its use is the lazy man's method and it should be relegated to the past where it belongs (fig. 4).

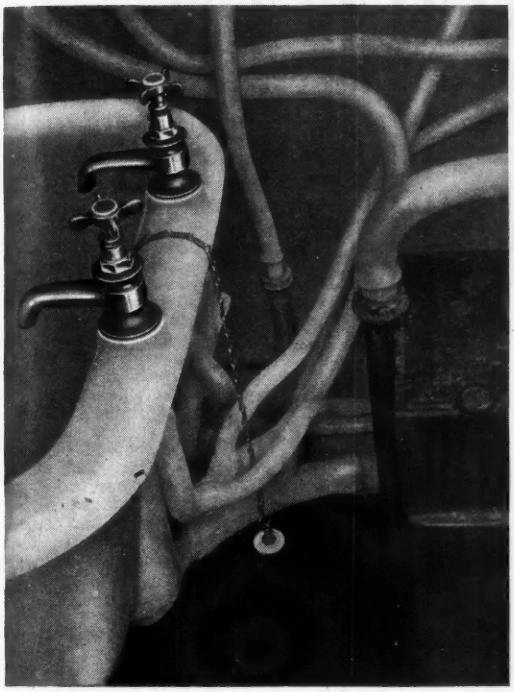

FIG. 4.—*A Study in Lead.*

It would appear that all the advantages claimed for both steel and "compo" are to be had by using copper pipe, and it is undoubtedly due to its many advantages that it is used to such a large extent in the aircraft and automobile industries. The methods employed by those industries for prefabricating petrol and hydraulic pipe lines by bending to jigs, afford scope for a study by the Gas Industry (Appendix 1). No evidence is yet available as to the suitability of thermo-plastic and other plastic pipes for the conveyance of gas, and the Gas Industry is now investigating the properties of these and other synthetic materials.

The gas internal installation requires careful planning at the drawing offices stage if the pitfalls of the past are to be avoided and if gas points are to be provided to meet the requirements of a complete gas fuel service. In this connexion considerable guidance is given in both the Report of the Gas Installations Committee and B.S.S. 1043, 1942.† It cannot be too strongly urged that the installation pipes should be of sizes which will be adequate for any demand they may reasonably be anticipated to meet. The fact, for example, that a gas water-heater is not installed as part of the equipment of a new house should not preclude one being fitted subsequently.

The Report takes cognizance of the fact that good gasfitting precludes any possibility of escapes, which are avoided by the use of satisfactory material, proper joints and sound craftsmanship. At the same time attention is directed to provisions for cleaning and extensions, neatness, position, rigidity of fixing, and methods of passing pipes through floors and walls.

### *Appliance Installation.*

Limitation of space permits little more than a passing reference to this important aspect of the subject of this Paper.

* **Paper to The Institution of Gas Engineers.**

† British Standard Code of Practice for the Provision of Engineering and Utility Services in Buildings.

The gas appliance is the focus of customer satisfaction on which depends the prosperity of the Gas Undertaking.*

Assuming, as one can, the proper design of the appliance, its correct selection for the particular circumstances for which it is required and the consistent control of gas quality, the whole prestige of the Gas Industry in the eyes of a consumer is centred on the performance and appearance of the appliances in his home.

The technique of gas appliance installation goes far beyond the actual siting of the appliance and making the necessary pipe connexions. A gas fitter must be able to adjust the appliance and leave it operating correctly in all respects.

Limitations of space do not permit consideration in this Paper of the important subject of appliance adjustment, and only a passing reference can be made to some of the more important aspects of the methods suggested for connecting appliances in post-war homes.

Such unsightly pipe connexions as have been witnessed in the past have resulted from lack of planning in the first stages of the construction of buildings. A point located somewhere near where it was anticipated a gas appliance might eventually be required left the fitter no alternative but to "strangle" a piece of pipe between the point and the appliance he had subsequently to fit. An outstanding example was the practice of leaving a point for a gas fire which consisted of a cap protruding above the floor at the side of the chimney breast and usually some inches inside the return of the brickwork. The final connexion thus had to circumnavigate the corner, the curb and the fireplace before it reached the fire.

Concealed connexions to gas fires are recommended in all future houses. If a gas fire is not to be installed at the time of building, the supply may still be laid to the back of the floor of the fire opening or, alternatively, a sleeve may be embedded in the concrete to permit the subsequent insertion of the connecting pipe when a gas fire is required. A suggested arrangement is shown elsewhere.† Wherever possible all installation pipes should be concealed up to the point of connexion to the appliances (fig. 5). Careful planning in advance should enable the point to be located to correspond with the gas connexion of the appliance, and ball-jointed unions of the type used on the meter bar would give sufficient latitude to correct for small errors in dimensions.

Where the exposure of connecting pipes is unavoidable, the pipe work should be well fitted and "finished" to tone with the appearance of the appliance and its surroundings. For this reason it may be advantageous to use copper or brass pipe where exposed, even though the concealed parts of the installation are of steel pipe due to the ease with which the former may be plated or painted.

Special brass pipe is required for limited use, such as, for example, for the short connecting pipe between the permanent, concealed installation pipe and a sink heater or radiator. As it is normally required for screwed connexions it should be of external diameter and wall thickness equal to that of an appropriate size of steel or wrought-iron

* "Consumer Service," Le Fevre, R. N., *Trans. Inst. Gas Eng.*, 1937-38, **86**, 1048.

† Le Fevre, R.N., *Manual of Practical Gas Fitting* (Walter King Limited), 1939, Figure, 153 and 154.

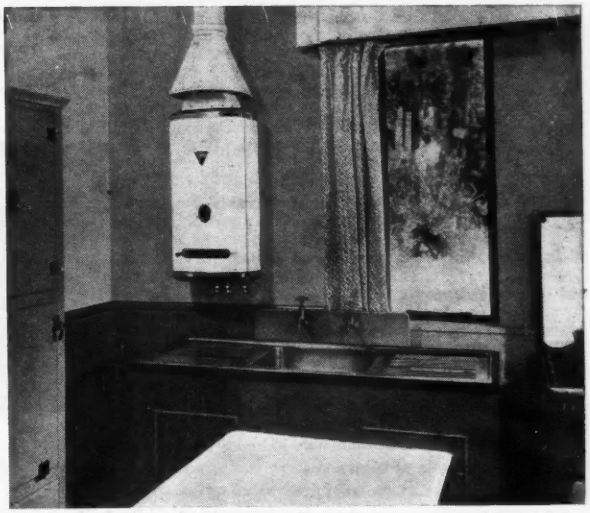

FIG. 5.—*An Example of Concealed Pipe-Work.*

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pipe to enable the B.S.P. thread to be used. Hitherto brass pipe (measured and designated by its external diameter) has been screwed with a non-standard and now obsolescent form of screw thread known as the "brass" thread. Owing to the approximate relationships between ⅜ in., ½ in., and ¾ in. brass pipe and ¼ in., ½ in., and ¾ in. steel and wrought-iron pipe respectively, attempts were made to effect connexion between the two types of thread, and also to cut a B.S.P. thread on brass pipe which was slightly below correct diameter, and of such low gauge as to be almost severed by the screw thread.* The Gas Industry Committee of the British Standards Institution is now preparing a specification for this special brass pipe.

Points at the termination of installation pipes to which appliances are not immediately to be connected should be terminated by a flush-fitting indicating cap, a suitable form of which is also now in process of being standardized.

The convenience and popularity of portable appliances has resulted in the availability of a wide range of appliances of this type The British Standard plug and socket gas connector (B.S. 570, 1934) and similar suitable types ensure interchangeability of connexion and enable plug points to be fitted in all suitable locations. Over two million of these connectors are known to be installed, and improvements now being made should increase their popularity still further. It is hoped that at least one socket will be fitted in the kitchen of every post-war home, at a height of approximately 2 ft. 6 in. above the floor line, thus facilitating convenient connexion of gas poker, portable heater or gas iron as required.

### Conclusions.

The provision of a common high standard of gas installation practice is a national problem. Good practice in one place will react favourably to gas in many places elsewhere. The well-fitted gas fire in a London hotel is seen and remembered by visitors from all over the country. The craftsmanship and good service given by the local gas-fitter in the smallest Gas Undertaking may influence the opinion of the senior government official or prominent architect who happens to live in its area of supply.

The Gas Industry has already at its command appliances and equipment of a high order. Much work has been done and is still being done to develop and standardize what is best in both method and material.

There may be some who will say, "This new idea is good but it's impossible to change over to it now. It's too late. Look at the thousands we have in existence. The new will not interchange with the old." But, unless the Gas Industry is to stagnate, the change must come and, once made, experience has shown how soon it is accepted. The vast programme of post-war building affords an opportunity, which may never recur to the Gas Industry, to break with obsolete and non-standard methods and adopt those now accepted as best.

As in the past, the human element enters prominently into considerations of good installation practice, and post-war work is closely linked with the problem of training the personnel which carries out the work. In this connexion it would appear desirable to aim at training an all-round gas-appliance mechanic who would be capable of carrying out the complete gas installation, adjusting all the appliances, and effecting their subsequent maintenance service.

In spite of improvement in building construction in gas-appliance design, and in installation materials and methods, the basic technique of the gasfitter will remain substantially the same. His work will be, as it always has been, the real front line of the Gas Industry's activities. On him, his work and the way he goes about it depend the whole of the Industry's relations with its consumers.

### Appendix.

*Notes on Methods of Bending Prefabricated Pipes.*

The difficulty experienced in bending tubes with a high diameter over thickness ratio is caused by the tendency of the tube, during bending, either to flatten at the point of bend or to crinkle along the inner radius.

The normal method of overcoming this difficulty is to load the tube with sand, resin or an alloy of low melting-point. After loading, the tube is bent round a former or template to the required form, the bending operation frequently being carried out by mechanical presses. This process needs careful attention to the removal of the loading material after the bending operation.

There has recently been developed a new method of bending thin-walled tubing using a loading medium of oil under high pressure. This method has been employed with great success in the processing of Tungum tubing, up to ¾ in. diameter and 24 s.w.g. to highly complicated forms, involving bends with a mean radius as small as three times the diameter of the tube.

The process consists essentially of loading the tube with oil under high pressure up to 2,000 or 3,000 lb. per sq. in, according to the diameter and thickness, in order to bring the hoop stress of the tube nearly to yielding point. The hoop stress being double the longitudinal stress, subsequent bending ensures that all stresses in the tube, during the bending operation, are tensile. This eliminates any tendency to form wrinkles—which are primarily due to instability under compressive stress—on the inner radius.

* Dunkley, S. F., and Le Fevre, R. N., *Notes on Screw Threads used in the Gas Industry*, 1936 (Walter King Limited).

# Letter to the Editor

## Gas Staff Organization

Dear Sir,—It has been noted from time to time that mention has been made in various articles appearing in the "Journal" that organization of the staff within the Industry is desirable.

For the information of your contributors and any others interested I would like to state that in the course of the last few months the staffs of the Croydon, Lea Bridge, Tottenham, and Wandsworth Gas Companies have each formed a Staff Association to look after the interest and well-being of its members, the aggregate membership of these associations now being some 77% of the total staffs concerned.

The activities of these Associations are co-ordinated by a Central Committee consisting of representatives from each association. This Committee deals with matters affecting the common welfare of all the member associations, and such items as are not competent for the local association to settle or upon which agreement cannot be reached with the respective management.

In the short period since the formation of these associations much good has been done in the matter of salaries, holidays, and working conditions generally. The Central Committee is already engaged on a review of the position of all grades of staffs—administrative, clerical, and technical—with a view to formulating a unified salary policy in accord with professional status and responsibilities.

The Federation of Gas Employers (London District Committee) recognizes the Central Committee of Gas Staff Associations as the negotiating body for its member associations. In the present formative condition of development of this movement it may be premature to put expectations as high as our hopes, but such contacts as have been made with the various managements encourage the belief that (in London at any rate) the employers are receptive to the idea of negotiation on matters of adequate and attractive remuneration and working conditions for the personnel of the Industry.

The idea of a Trade Union proper for gas staffs has been freely canvassed in the London area, but met with little or no support from the staffs mentioned above. The present method of combination has been well received and, given the support of an active and live membership, may well develop from its present regional state into a pattern for the whole of the country.

Any further information on this matter will be gladly sent to those interested.

*Central Committee of Gas Staff Associations,*
*Gas-Works, Fairfield Street,*
*Wandsworth, S.W.* 18.
*June* 29, 1944.

Yours faithfully,
E. W. Munn,
Secretary.

## 1944 "Journal" Directory

Page 20. CREWKERNE. W. J. Burley (Okehampton), *M. & S.*, *vice* H. A. Cole.
„ 52. OXFORD. A. Tran, *G. M. & C. E.*, *vice* W. E. Caton.
„ 64. SKELMERSDALE. A. Gardiner, *E. & M.*, *vice* R. O. Roberts.

## Diary

July 11.—National Federation of Gas Coke Associations: General Committee, Gas Industry House, 10 a.m.
July 11.—N.G.C. Central Executive Board, Gas Industry House, 2 p.m., followed by B.G.F. Council Meeting.
July 17.—London and Counties Coke Association: Committees—Finance, 11 a.m.; Executive, 11.30 a.m.; Central, 1.30 p.m.; Gas Industry House.
July 28.—B.G.F. Domestic Heat Services Committee, Gas Industry House, 2.30 p.m.

**Severn Valley Gas Corporation** is paying a final Ordinary dividend of 2½%, making 5½% for the year, and 6% for the year on the Deferred shares, both the same as for last year.

**The Helensburgh Corporation Gas-Works** last week celebrated its 100th year of production. Founded in 1844 as a private company, the works were taken over in 1899 by the Corporation, which has maintained the production since that date.

**The John Wright and Eagle Range Savings Groups** target for the "Salute the Soldier" Savings Week was exceeded by over 40%, reaching the sum of £9,841.

**The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.**

# GAS PRODUCTS PRICES

### The London Market July 3.

A Government Order came into effect on March 1 controlling the price of Benzole and Coal Spirit and replacing the Control of Coal Tar Naphtha and Xylole Order, 1943.

The Order is known as the Control of Benzole and Coal Spirit Order, 1944 (S.R. & O. 1944, No. 172).

By this Order the price of Motor Benzole is fixed at 2s. per gallon. The Order also lays down the method of evaluating Crude Benzole.

The Order also calls for periodical returns to the Ministry of Fuel and Power from all producers of Crude and Refined Benzole.

The only item of interest in connexion with the Coal Tar products market is the issue of Government Order designated the Control of Toluene (No. 4) Order, 1944 (S. R. & O. 1944, No. 170), which contains an amendment of the Control of Toluene (No. 3) Order, 1943.

Prices of Coal Tar products are unchanged.

### The Provinces July 3.

The average prices of gas-works products during the week were: Pitch and Crude Tar,* Toluole, naked, North, 90's, 1s. 11d. to 2s. 1d., pure, 2s. 7½d. (controlled by the Control of Toluene No. 3 Order, dated July 14, 1943, operative from July 20, 1943). Benzole and Coal Spirit, also Coal Tar Naphtha and Xylole, are now controlled by the Control of Benzole and Coal Spirit Order, 1944, dated Feb. 18, 1944, S. R. & O. 1944, No. 172, operative from March 1. Carbolic acid, 60's, naphthalene, anthracene, creosote oil (hydrogenation), coal tar oils (timber preservation, &c.), and strained anthracene oil controlled by the Coal Tar Products Prices Order, 1943, dated Oct. 20, 1943 (S. R. & O. 1943, No. 1528), operative from Nov. 15, 1943.

* In regard to pitch and crude tar prices we would ask readers to refer to the editorial note on p. 396 of the "JOURNAL" for Sept. 10, 1941.

### Scotland July 1.

Trading continues active, particularly in the home market. Refined tar*: Yield to distillers is 4½d. per gallon *ex* Works, naked. Creosote oil: Timber preserving quality,* 5½d. to 6½d.; hydrogenation oil,* 5⅞d.; low gravity or virgin oil,† 7½d. to 7½d.; benzole absorbing oil,* 6½d. to 8d. per gallon. Refined cresylic acid* is 3s. 6d. to 4s. 6d. per gallon *ex* Works, naked, according to quality. Crude naphtha†: 6½d. to 7d. per gallon. Solvent naphtha*: Basic prices delivered in bulk, 90/160 grade, 2s. 8d. and 90/190 Heavy naphtha, Unrectified, 1s. 10½d.; Rectified, 2s. 2d. per gallon. Pyridine†: 90/160 grade, 13s., and 90/140 grade, 15s. per gallon.

* Price controlled. † Uncontrolled.


## TRADE CARDS

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Address your orders and enquiries for
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# GAS STOCKS AND SHARES

The volume of business on the Stock Exchange last week was on a small scale, but the general tone was firm on the encouraging war news. British Funds were particularly strong, while several leading industrials registered rises in value.

On the whole the Gas Market was quiet and inclined to be irregular, although prices generally were well maintained. Bombay and United Kingdom preference each hardened 6d., but Gas Light units closed 6d. lower at 20s. 6d. There were no special features during the month and fewer price changes than usual, and although the majority of movements were in an upward direction they were mostly confined to a point or two.

The following quotations were changed during the week:

**OFFICIAL LIST**

| | | | |
|---|---|---|---|
| Bombay ... ... ... ... ... | 32/—34/- | +-/6d. |
| British 5½ p.c. "B" Pref. (*x.d.*) ... | 108—113 | June 26 |
| Croydon 5 p.c. Deb. (*x.d.*) ... | 118—123 | " |
| East Surrey 5 p.c. Deb. (*x.d.*) ... | 20/—21/- | " |
| Gas Light Units ... ... ... | 20/—21/- | —-/6d. |
| Ditto 3½ p.c. max. ... ... ... | 78½—81½ | +½ |
| Primitiva Holdings ... ... ... | 9/—11/- | +-/6d. |
| Severn Valley Ord. (*x.d.*) ... ... | 21/9—22/9 | June 26 |
| South Metropolitan Ord. ... ... | 86—91 | —1 |
| Ditto 3 p.c. Deb. (*x.d.*) ... ... | 83—87 | June 26 |
| Southampton ... ... ... | 105—110 | —2 |
| United Kingdom 4½ p.c. 1st Cum. Pref. ... ... ... ... ... | 21/—23/- | +-/6d. |

# Quotations on the London and Provincial Stock Exchanges

## OFFICIAL LIST

| Issue. £ | When ex-Dividend. | Dividends Interest. Amnt. or Rate% Prev. Hf. Yr. Actual. | Dividends Interest. Amnt. or Rate% Last Hf. Yr. Actual. | NAME | Quotations June 29 |
|---|---|---|---|---|---|
| 1,767,439 | March 13 | 20/- | 20/- | Alliance & Dublin Ord. ... | 100—110 |
| 374,000 | June 26 | 2 | 2 | Do. 4 p.c. Deb. ... ... | 97—102 |
| 891,664 | May 8 | 6d. | 6d. | Assod. Gas & Water U'd'ts Ord. | 22/—23/- |
| 388,938 | " | 7½d. | 7½d. | Do. Deferred ... ... | 23/—24/- |
| 500,000 | " | 2½ | 2½ | Do. 4½ p.c. Red. Cum. Pref. | 19/9—20/9 |
| 535,545 | " | 2 | 2 | Do. 4 p.c. Red. Cum Pref. | 20/—21/- |
| 341,966 | " | 2 | 2 | Do. 4 p.c. Irred. Cum. Pref. | 17/9—18/9 |
| 561,370 | Feb. 14 | 70/- | 70/- | Barnet Ord. 7 p.c. .. ... | 155—160 |
| 300,000 | June 12 | 8½d. | 10½d. | Bombay, Ltd. .. ... ... | 32/—34/- |
| 690,407 | Feb. 14 | 70/- | 70/- | Bournemouth 7 p.c. max. ... | 150—155 |
| 362,025 | June 12 | 2 | 2 | Do. 4 p.c. Deb. ... | 100—105 |
| 659,955 | Feb. 28 | 25/- | 45/- | Brighton, &c., 5 p.c. Con. .. | 95—100 |
| 855,000 | March 13 | 60/- | 60/- | Brit. Gas Light Ord. ... ... | 117—122 |
| 545,000 | June 26 | 2½ | 2½ | Do. 5½ p.c. 'B' Cum. Pref. | 108—113 |
| 120,000 | " 12 | 2 | 2 | Do. 4 p.c. Red. Deb. | 94—99 |
| 10,000 | Nov. 6 '33 | 4/6 | 4/6 | Cape Town, Ltd., 4½ p.c. Cu. Pf. | 70/—90/- |
| 626,860 | Feb. 14 | 50/- | 70/- | Cardiff Con. Ord. ... ... | 120—125 |
| 24,500 | May 30 | 8½d. | 8½d. | Colombo 7 p.c. Pref. ... ... | 21/6—23/6 |
| 764,169 | March 27 | 4.78d. | 4.78d. | Colonial Gas Assn. Ltd. Ord. .. | 12/6—17/6 |
| 400,000 | " | 7.649d. | 7.649d. | Do 8 p.c. Pref. ... | 15/—20/- |
| 1,748,090 | July 22 '40 | 30/- | 30/- | Commercial Ord. ... ... | 63—68 |
| 620,000 | June 15 | 1½ | 1½ | Do. 3 p.c. Deb. ... ... | 70—75 |
| 286,344 | Feb. 21 | 2½ | 2½ | Do. 5 p.c. Deb. ... ... | 110—115 |
| 807,560 | " | 60/- | 60/- | Croydon sliding scale ... ... | 123—128 |
| 644,590 | " | 50/- | 50/- | Do. max. div. ... ... | 102—107 |
| 620,385 | June 26 | 2½ | 2½ | Do. 5 p.c. Perp. Deb. ... | 118—123 |
| 179,500 | Feb. 14 | 50/- | 50/- | East Surrey 'B,' 5 p.c. ... ... | 103—108 |
| 176,461 | June 26 | 2½ | 2½ | Do. 5 p.c. Deb. (Irred.)... | 117—122 |
| 239,135 | Nov. 8 | 6d. | 6d. | Gas Consolidation Ord. 'A' ... | 20/—21/- |
| 150,000 | " | 4½ | 4½ | Do. Ord. 'B' ... | 19/—21/- |
| 250,000 | May 8 | 2 | 2 | Do. 4 p.c. Red. Cum. Pref. | 18/—20/- |
| 9,107,811 | Feb. 14 | 3½d. | 6d. | Gas Light & Coke Ord. ... | 20/—21/-a |
| 2,600,000 | " | 35/- | 35/- | Do. 3½ p.c. max. ... ... | 78½—81½ |
| 1,477,106 | " | 2 | 2 | Do. 4 p.c. Con. Pref. ... | 99—102 |
| 2,993,000 | July 12 | 1⅞ | 1⅞ | Do. 3½ p.c. Red. Pref. ... | 98—101 |
| 1,602,497 | May 30 | 1½ | 1½ | Do. 3 p.c. Con. Deb. ... | 85—88 |
| 2,642,770 | " | 2½ | 2½ | Do. 5 p.c. Red. Deb. ... | 107—110 |
| 1,500,000 | " | 2½ | 2½ | Do. 4½ p.c. Red. Deb. ... | 107—110 |
| 700,000 | March 6 | 1⅞ | 1⅞ | Do. 3½ Red. Deb. ... | 97—100 |
| 1,600,000 | May 13 '40 | 80/- | 80/- | Imperial Continental Cap. ... | 91—96 |
| 43,820 | Jan. 31 | 1½ | 1½ | Do. 3½ p.c. Red. Deb. ... | 97—100 |
| 231,978 | Feb. 21 | 50/- | 50/- | M.S. Utility 'C' Cons. ... ... | 100—105 |
| 918,657 | " | 2 | 2 | 4 p.c. Cons. Pref. ... ... | 95—100 |
| 675,000 | May 1 | ‡40/- | ‡40/- | Montevideo, Ltd. .. ... ... | 82—87 |
| 300,000 | April 24 | 70/- | 80/0 | Oriental, Ltd. ... ... ... | 140—145 |
| 368,537 | June 12 | 40/- | 57/6 | Plymouth & Stonehouse 5 p.c. | 106—111 |
| 621,667 | Feb. 7 | 72/6 | 72/6 | Portsmouth & Gosport Cons. | 121—126 |
| 1,381,363 | May 15 | †9½d. | †9½d. | Primitiva Holdings, Ltd. Ord. | 9/—11/- |
| 1,333,900 | June 12 | 3 | 3 | Do. 6½ p.c. Red. Cum. Pref. | 97—102 |
| 648,999 | " 26 | 6¾ | 6¾ | Severn Val. Gas Cor. Ld. Ord. | 21/9—22/9 |
| 1,597,972 | March 13 | 2½ | 2½ | Do. 4½ p.c. Cum. Pref. ... | 20/6—21/6 |
| 1,528,714 | May 22 | 3½d. | 6d. | South East'n Gas Cn. Ld. Ord. | 19/9—20/9 |
| 2,000,000 | Feb. 21 | 2½ | 2½ | Do. 4½ p.c. Red. Cum. Pref. | 20/3—21/3 |
| 1,068,869 | " | 2 | 2 | Do 4 p.c. Irred. Cum. Pref. | 19/3—20/3 |
| 1,709,895 | " 14 | †20/- | †60/- | South Met. Ord. .. ... ... | 86—91 |
| 1,135,812 | " | 3 | 3 | Do. 6 p.c. Irred. Pref. ... | 122—127 |
| 850,000 | " | 2 | 2 | Do. 4 p.c. Irred. Pref. ... | 93—98 |
| 1,895,445 | June 26 | 1½ | 1½ | Do. 3 p.c. Perp. Deb. ... | 83—87 |
| 2,000,000 | Jan. 17 | 2½ | 2½ | Do. 5 p.c. Red. Deb. ... | 102—107 |
| 1,643,795 | Feb. 7 | 40/- | 60/- | South Suburban Ord. 5 p.c ... | 112—117 |
| 512,825 | " | 2½ | 2½ | Do. 5 p.c. Perp. Pref. ... | 107—112 |
| 500,000 | " | 2 | 2 | Do. 4 p.c. Perp. Pref. ... | 96—101 |
| 250,000 | " | 1⅞ | 1⅞ | Do. 3½ p.c. Red. Pref. ... | 90—95 |
| 888,587 | June 12 | 2½ | 2½ | Do. 5 p.c. Perp. Deb. ... | 119—124 |
| 750,541 | Feb. 7 | 50/- | 60/- | Southampton Ord. ... ... | 105—110 |
| 350,000 | " 14 | 2½ | 2½ | Swansea 5½ p.c. Red. Pref. ... | 100—105 |
| 1,076,495 | " 21 | 50/- | 50/- | Tottenham & District Ord. ... | 113—118 |
| 338,555 | " | 2½ | 2½ | Do. 5 p.c. Pref. ... ... | 107—112 |
| 453,380 | June 12 | 2 | 2 | Do. 4 p.c. Perp. Deb. ... | 97—102 |
| 1,247,505 | May 30 | 4½d. | 7½d. | U. Kingdom Gas Cor. Ord. ... | 21/—22/- |
| 1,085,952 | " | 5½d. | 5½d. | Do. 4½ p.c. 1st Cum. Pref. ... | 21/—23/- |
| 772,709 | " 15 | 4½d. | 4½d. | Do. 4 p.c. 1st Red. Cum.Pref. | 19/—21/- |
| 745,263 | June 19 | 5½d. | 5½d. | Do. 4½ p.c. 2nd Non.Cum. Pf. | 17/—19/- |
| 1,200,000 | March 13 | 1½ | 1½ | Do. 3½ p.c. Red. Deb. ... | 97—102 |
| 380,606 | May 22 | 66/3 | 66/3 | Uxbridge, &c., 5 p.c. ... ... | 119—124 |
| 1,371,138 | Jan. 31 | 50/- | 50/- | Wandsworth Consolidated ... | 113—118 |
| 525,768 | " | 2 | 2 | Do. 4 p.c. Pref. ... ... | 98—101 |
| 1,343,964 | June 12 | 2½ | 2½ | Do. 5 p.c. Deb. ... ... | 119—124 |
| 1,383,745 | " | 2 | 2 | Do. 4 p.c. Deb. ... ... | 97—102 |
| 1,558,342 | Feb.. 14 | 50/- | 50/- | Watford & St. Albans Ord. ... | 112—117 |
| 300,000 | June 5 | 1½ | 1½ | Do. 3½ p.c. Red. Deb. ... | 95—100 |

## SUPPLEMENTARY LIST

| Issue. £ | When ex-Dividend. | Dividends Interest. Amnt. or Rate% Prev. Hf. Yr. Actual. | Dividends Interest. Amnt. or Rate% Last Hf. Yr. Actual. | NAME. | Quotations June 29 |
|---|---|---|---|---|---|
| 351,685 | June 12 | 2½ | 2½ | Brighton, &c., 5 p.c. Perp. Deb. | 117—122 |
| 415,250 | " | 2 | 2 | Bristol Gas Co., 4 p.c. New Deb. | 100—103 |
| 140,205 | Feb. 21 | 70/- | 70/- | Cambridge, &c., 7 p.c. Cons. 'B' | 140—145 |
| 295,932 | March 13 | 50/- | 50/- | Cheltenham, 5 p.c. Cons.Ord.... | 98—103 |
| 42,500 | June 12 | 2 | 2 | Do. 4 p.c. Perp. Deb.... | 100—105 |
| 150,000 | Feb. 21 | 2 | 2 | Croydon Gas, 4 p.c. Pref. (irr.) | 93—98 |
| 130,000 | June 26 | 2 | 2 | Do. 4 p.c. Deb. ... | 97—102 |
| 146,700 | Feb. 14 | 2½ | 2½ | East Surrey, 5½ p.c. Pref. 'A' ... | 110—115 |
| 53,220 | " | 3 | 3 | Do. 6 p.c. Cum. Pref. ... | 120—125 |
| ... | Aug. 19 '40 | 40/- | 40/- | Eastbourne, 'B' 3½ p.c.... .. | 97—102 |
| 117,425 | Feb. 5 '40 | 80/- | 80/- | East Wight Cons. 5 p.c. ... | 85—90 |
| 25,000 | June 19 | 2½ | 2½ | Guildford 4½ p.c. Red. Deb. ... | 100—105 |
| 156,600 | Feb. 14 | 50/- | 50/- | Hampton C't, 5 p.c. Cons. Ord. | 95—100 |
| 18,000 | Dec. 29 '41 | 3½ | 3½ | Malta & Med'n., 7 p.c. 1st Pref. | 30—40 |
| 10,845 | June 30 '41 | 37/6 | 37/6 | Do. 7½ p.c. 2nd Pref. | 30—40 |
| 50,000 | Feb. 21 | 52/3 | 52/3 | Mid. South. Util., 'A' Cons. 5 p.c. | 105—110 |
| 70,380 | June 19 | 2½ | 2½ | Newport (Mon.), 5 p.c. Deb... | 115—120 |
| 65,000 | May 8 | 2½ | 2½ | North Middlesex, 5 p.c. Pref. ... | 105—110 |
| 70,000 | March 13 | 2½ | 2½ | Plymouth & Stone., 5 p.c. Deb. | 115—120 |
| 76,501 | June 19 | 2 | 2 | Reading, 4 p.c. Perp. Deb. ... | 95—100 |
| 74,777 | March 31 | 2 | 2 | Romford, 4 p.c. Debs. (Reg.) ... | 97—102 |
| 21,000 | June 12 | 2½ | 2½ | Slough, 5 p.c. Perp. Deb. ... | 117—122 |
| 211,740 | " | 2½ | 2½ | Southampton, 5 p.c. Red. Deb. | 105—110 |
| 363,575 | Jan. 3 | 2½ | 2½ | Tottenham, 5 p.c. Reg. Red. Mt. | 98—102 |
| 202,019 | April 17 | 77/- | 75/- | Tunbridge Wells, 4 p.c. Scale ... | 125—130 |
| 135,257 | June 12 | 2½ | 2½ | Uxbridge &c., 5 p.c. Perp. Deb. | 118—123 |

## PROVINCIAL EXCHANGES

| | | | | | Quotations June 26 |
|---|---|---|---|---|---|
| 804,948 | Feb. 28 | 2½ | 2½ | Bath Cons. ... ... ... | 114—116 |
| 122,577 | Feb. 21 | — | — | Blyth 5 p.c Ord. ... ... | 120—122 |
| 1,667,250 | Feb. 21 | 2½ | 2½ | Bristol, 5 p.c. max. ... ... | 120—122 |
| 120,420 | June 12 | 2 | 2 | Do. 1st 4 p.c. Deb. ... ... | 100—102 |
| 415,250 | " | 2 | 2 | Do. 2nd 4 p.c. Deb. ... | 100—102 |
| 328,790 | " | 2½ | 2½ | Do. 5 p.c. Deb. ... ... | 100—102 |
| 157,150 | Jan. 31 | 2½ | 3½ | Chester 5 p.c. Ord. ... ... | 121—123 |
| 92,500 | June 12 | 2 | 2 | Do. 4 p.c. Pref. ... ... | 98—102 |
| 36,430 | " | 1¾ | 1¾ | Do. 3½ p.c. Deb. ... ... | 80—82 |
| 41,890 | " | 2 | 2 | Do. 4 p.c. Red. Deb. ... | 86—90 |
| 542,270 | Feb. 14 | 3 | 4½ | Derby Cons. ... ... ... | 103—102 |
| 55,000 | Dec. 13 | 2 | 2 | Do. 4 p.c. Deb. ... ... | 127—132 |
| 40,000 | Feb. 21 | 5½ | 5½ | Exeter 10 p.c. ... ... ... | 95—100 |
| 10,000 | March 27 | 5 | 5 | Great Grimsby 'A' Ord. ... | 185—195 |
| 6,500 | " | 5 | 5 | Do. 'B' Ord. ... | 160—170 |
| 79,000 | " | 5 | 5 | Do. 'C' Ord. ... | 160—170 |
| 732,000 | Feb. 21 | 2 | 2 | Hartlepool G. & W. Cn. & New | 160—170 |
| 2,167,410 | Feb. 21 | 2½ | 2½ | Liverpool 5 p.c. Ord. ... ... | 92—93 |
| 490,681 | June 19 | 1⅞ | 1⅞ | Do. 3½ p.c. Red. Deb. Stk. | 114—115 |
| 245,500 | " | 2 | 2 | Do. 4 p.c. Red. Deb. Stk. | 95—100 |
| 306,083 | " | 2 | 2 | Do. 4 p.c. Deb. .. ... | 101—102 |
| 680,000 | " | 2½ | 2½ | Do. 5 p.c. Red. Stk. ... | 101¼—103½ |
| 20,000 | Dec. 21 | 2½ | 2½ | Long Eaton 5 p.c. Pref. ... ... | 104—109 |
| 80,000 | " | 2½ | 2½ | Do. 5 p.c. Deb. ... ... | 9—11 |
| 2,430,267 | Feb. 7 | 2½ | 2½ | Newcastle and Gateshead Con. | 105—110 |
| 682,856 | " | 2 | 2 | Do. 4 p.c. Pref. ... ... | 25/3—26/-a |
| 776,706 | Dec. 20 | 1⅞ | 1⅞ | Do. 3½ p.c. Deb. ... ... | 100—102 |
| 250,000 | " | 1⅞ | 1⅞ | Do. 3½ p.c. Red. Deb. ... | 99½—101½ |
| 73,186 | May 1 | 2 | 2 | Do. 4 p.c. Red. Deb. .... | 98—100 |
| 106,280 | Feb. 7 | 5 | 5 | Preston 'A' 10 p.c. ... ... | 99—101 |
| 188,219 | " | 3½ | 3½ | Do. 'B' 7 p.c. ... ... | 170—175 |
| 1,806,339 | Feb. 28 | 3½ | 3½ | Sheffield Cons. .. ... ... | 132—135 |
| 95,000 | Jan. 3 | 2 | 2 | Do. 4 p.c. Deb. ... ... | 145—147 |
| 332,351 | Feb 7 | — | — | Sunderland 6 p.c. max. ... | 98—100 |
| 192,150 | Feb. 7 | 2½ | 2½ | Weston-super-Mare Cons. ... | 112—114 |
| 64,338 | Jan. 3 | 2 | 2 | Do. 4 p.c. Deb. ... ... | 111—112½ |
| 33,340 | " | 3½ | 3½ | Do. 7½ p.c. Deb. ... ... | 99—101 |
| | | | | | 145—150 |

a —The quotation is per £1 of Stock. * Ex div † For year. ‡ Paid free of income-tax.